ETH zürich

# An environmental perspective on the management of wood in Switzerland

LCF DF: Environmental use of wood resources

December 4th 2015

# Starting point

- Wood is large sink for carbon dioxide and renewable resource suitable for various material and energy purposes
- Sustainable use of wood can lower impacts on climate change an can reduce demand for non-renewable resources
- Increasing wood stocks in Swiss and European forests
  - Net increments higher than harvesting
- Need for new strategies facilitating a sustainable wood mobilisation and use

# Goals

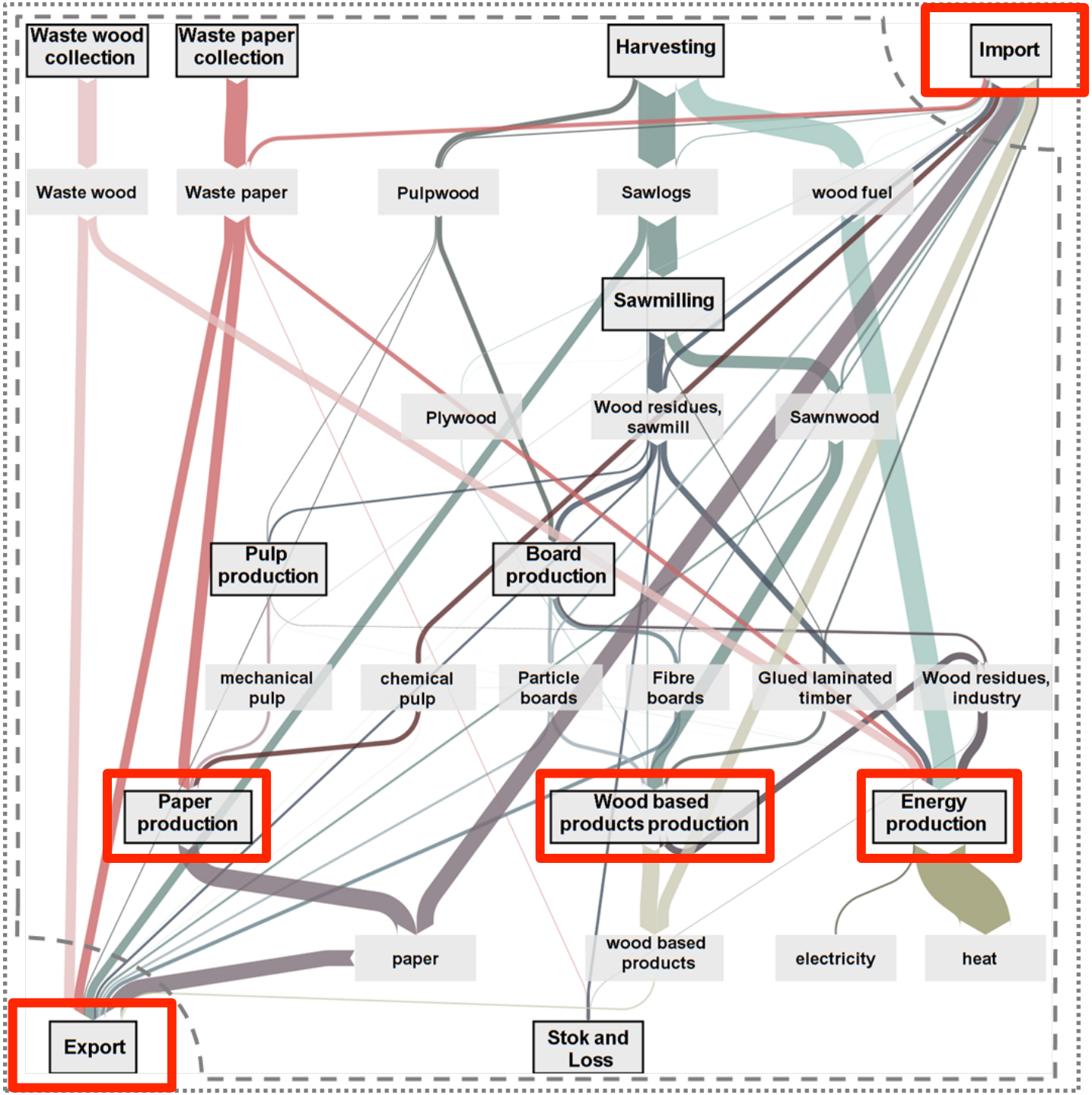
- Environmental assessment of the wood value chain
  - Systemic perspective on current wood use in Switzerland
- Analysis of wood sourcing contribution to overall process impacts
  - Current cascading potential of wood (wood-wood substitution)
- Environmental evaluation of wood performance
  - Current substitution potential of wood

- Discuss learnings to provide guidance for environmentally sustainable use of wood

# Part I: Environmental assessment of the wood value chain in Switzerland

- Combination of material flow analysis and life cycle assessment
- Systemic perspective on wood use in industry sectors

- MFA data: Statistics of federal offices and industry associations
- LCA data: ecoinvent v3.1 in the cut-off allocation system




**Wood use in Switzerland 2011 [m3 solid wood]**

System boundary

Country boundary

**Impact calculation**

MFA processes

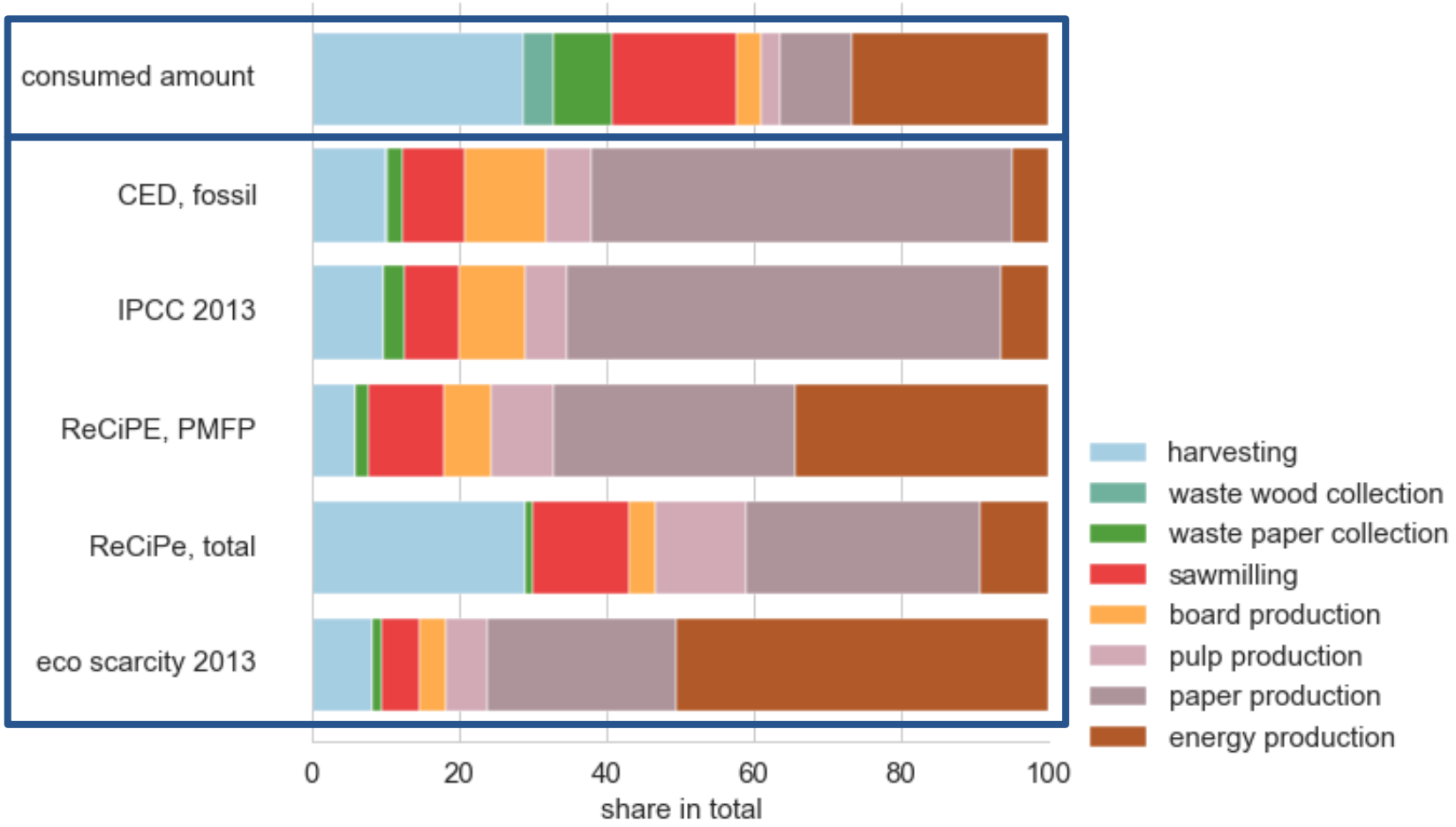
Statistical data

LCI activities

**MFA-LCA Modules**

Adapted from BAFU 2012

# Environmental impacts from wood consumption



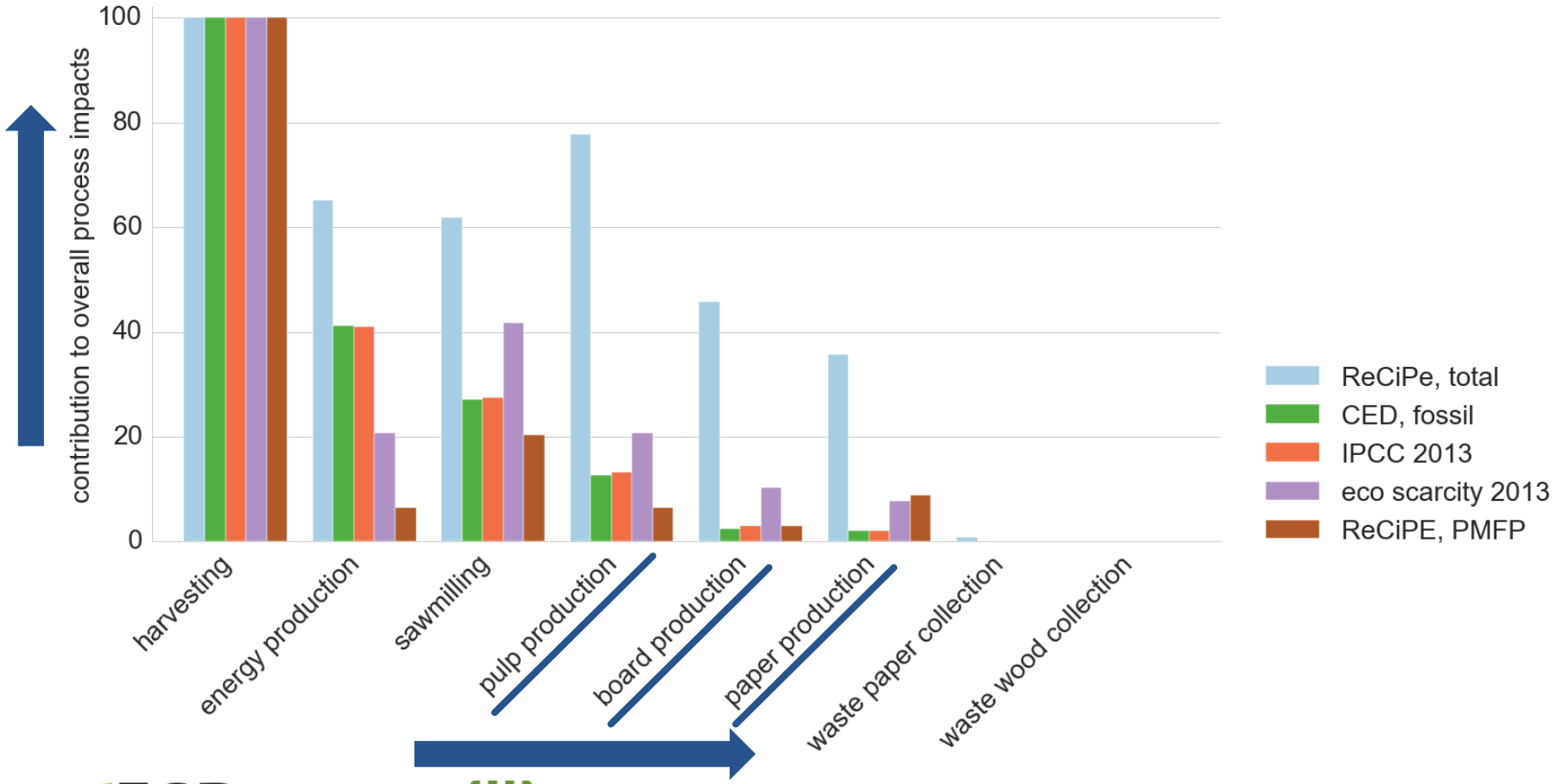
# Part II: Contribution of wood sourcing

- Impacts from primary wood provisioning compared to total product impacts
  - Impacts to the point of harvesting
- Indication for impact reductions that could be achieved by current cascading of wood
  - Replacing primary wood by waste wood

## Assumptions

- Waste wood is burden free
- No adaptations in production processes

# Contribution of primary wood provisioning on overall process impacts



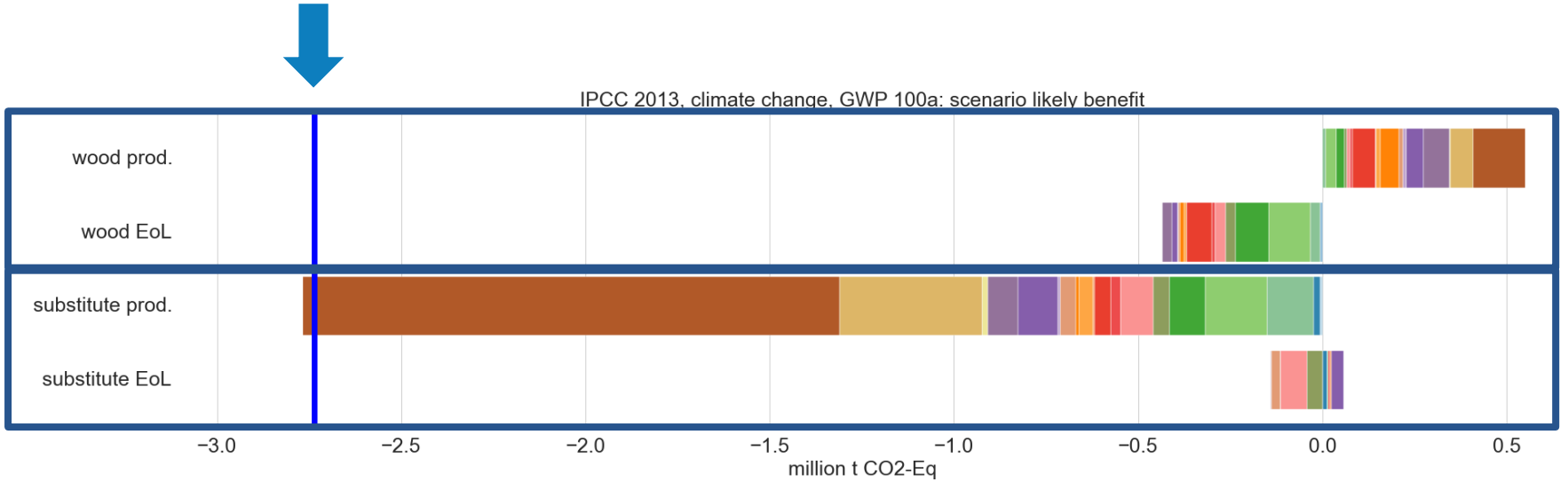
# Part III: Current environmental performance of wood

- Comparison of impacts from functionally equivalent wood and non-wood products
- Point of substitution on the level of semi-finished products
- Recycling, incineration and landfilling as end of life options

## Assumptions

- Substitution of current product specific market mix
- Identical lifetimes for wood and non-wood products
- No losses in end of life processing

# Impacts and benefits from substitution of current market mix: climate change




benefits from wood use

avoided burdens from non-use of substitutes

- sawnwood products subst. aluminium, primary
- sawnwood products subst. aluminium, secondary
- sawnwood products subst. steel, chromium, primary
- sawnwood products subst. steel, chromium, secondary
- sawnwood products subst. concrete
- sawnwood products subst. brick
- sawnwood products subst. polyethylene
- sawnwood products subst. polypropylene
- glued laminated timber subst. steel, primary
- glued laminated timber subst. steel, secondary
- plywood subst. steel, chromium, primary
- plywood subst. steel, chromium, secondary
- board, fibre subst. gypsum fibreboard
- board, fibre, soft subst. polystyrene
- board, fibre, soft subst. rock wool
- board, particle subst. glass
- board, particle subst. plaster
- electricity subst. electricity mix CH
- heat subst. natural gas
- heat subst. light fuel oil

# Carbon displacement factors

$$\text{Displacement factor} = GHG{\downarrow}non{-}wood\ product\ -\ GHG{\downarrow}wood\ product\ /wood\_amount{\downarrow}wood\ product$$

| Displacement factor | t CO2-eq/m3 wood |
|---|---|
| material application only | 0.26 |
| end of life only | 0.21 |
| ***material application plus end of life*** | ***0.47*** |
| energy application only | 0.44 |
| ***all applications including end of life*** | ***0.45*** |

# Key findings

- Wood use contributes to the reduction of GHG-emissions and the fossil CED
- Environmental performance of wood is highly dependent on environmental indicators and the type of use
- Today, environmental effects from the replacement of primary wood by waste wood are small
- Wood cascading can be beneficial in case that additional energy intense materials are replaced and an efficient use of energy at the end is not affected

# Recommendations

- Use more wood but take care of potential negative environmental effects (particulate matter, biodiversity)
- Use wood wisely (avoid losses and contaminations) to allow for an efficient energy use at the end of life
- Use wood in applications where it can replace energy and resource intensive materials (construction, furniture, energy)
- Be aware of opposing environmental effects

# Outlook

- Highlight sensitivities and calculate future scenarios
  - Energy substitution and incineration efficiencies
  - Effects from waste wood losses in cascading
  - Changes in wood use
- Environmental impacts from international wood trade
  - Region specific impacts on biodiversity from wood imports to Switzerland

# Acknowledgements

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Resource Wood
National Research Programme NRP 66

## Project partners

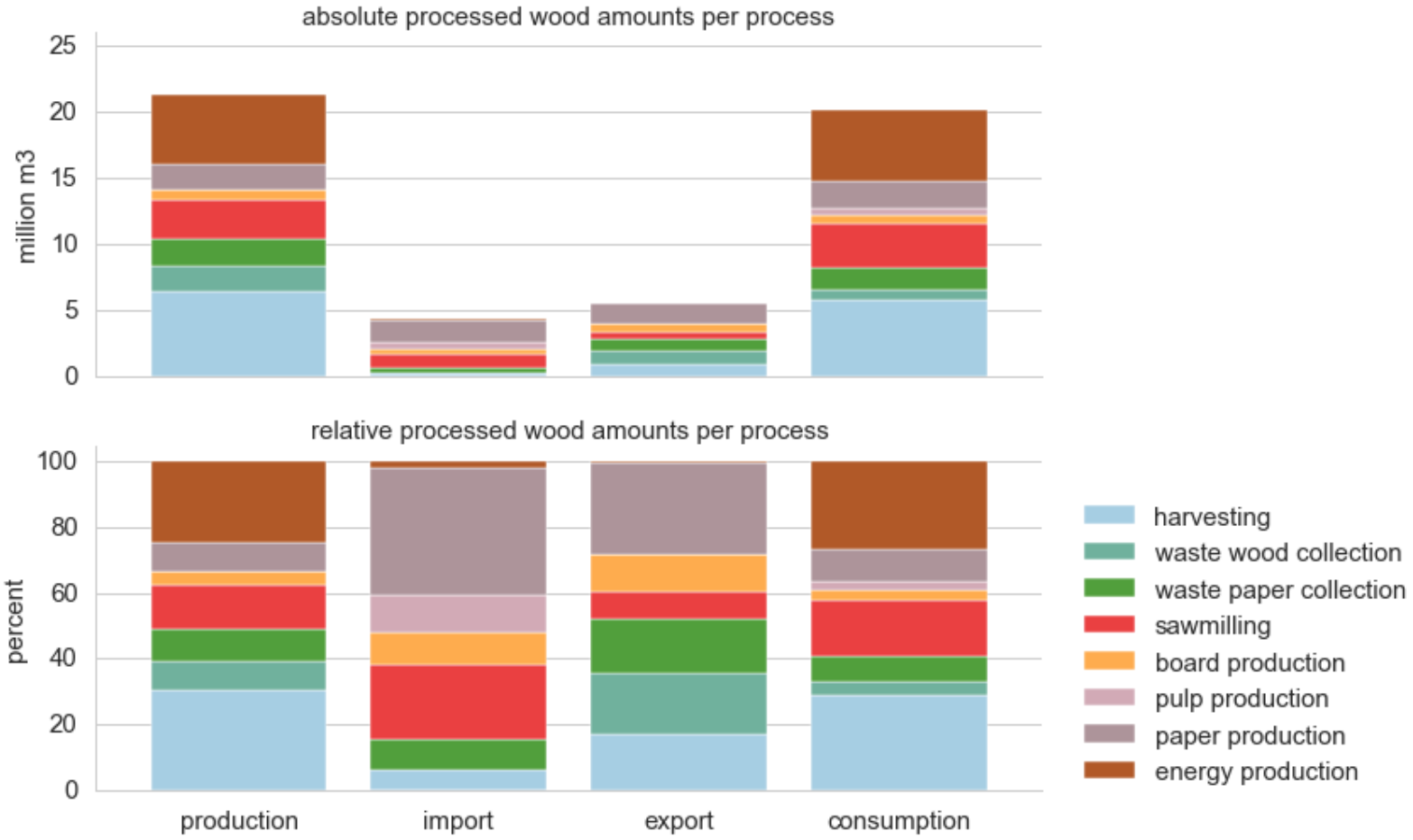
CHALMERS

AVENY

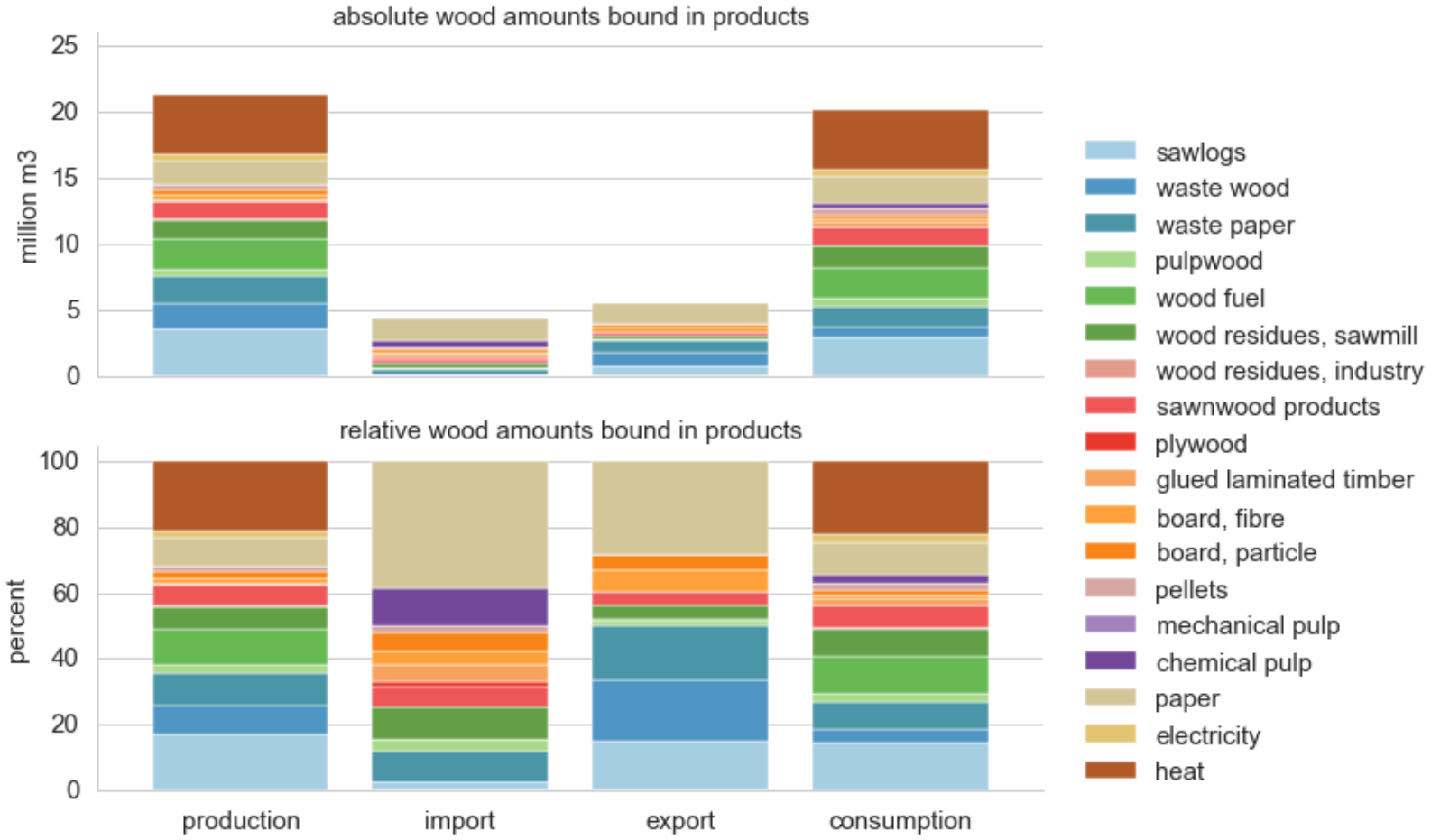
GEO PARTNER AG RESOURCE MANAGEMENT

# Backup slides

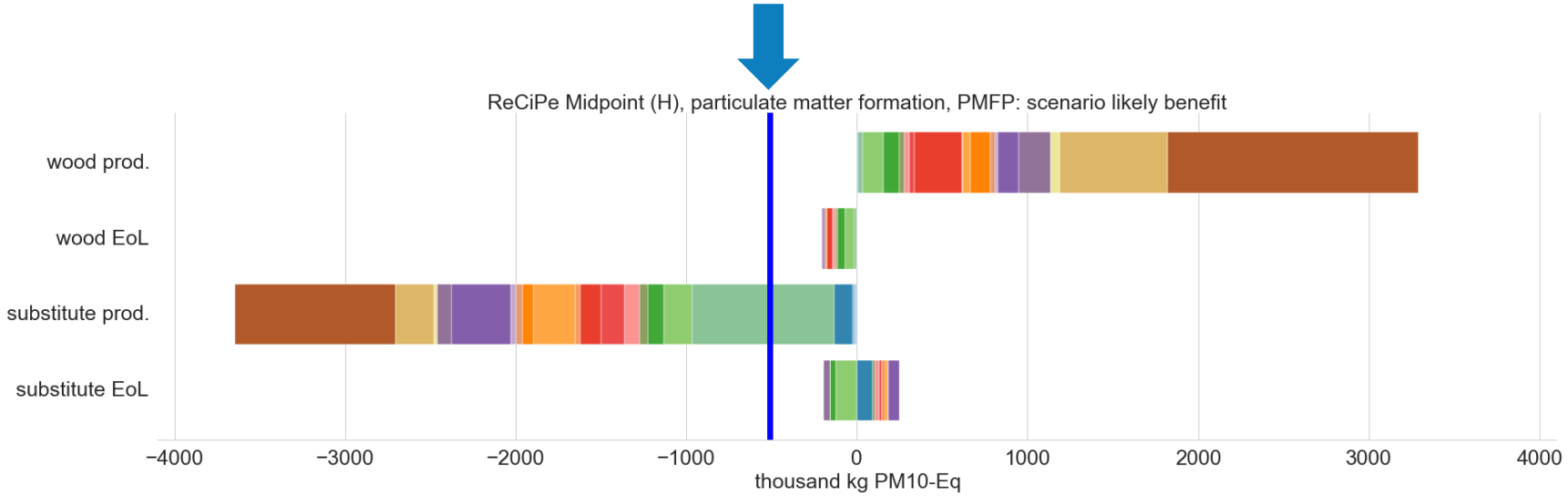
# Wood process perspective



# Wood product perspective



# Impacts and benefits from substitution of current market mix: particulate matter

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# Assumptions for calculation of displacement factors

- Paper sector not considered
- Heat from incineration of internally produced wood residues is not considered
- Carbon storage effects neglected (no time axis)
- No differences between consumed products from domestic production or production abroad